MEAP

MICHIGAN
EDUCATIONAL
ASSESSMENT
PROGRAM

# High School Test in Science

***Released Items***

***Spring 2003***

**4** How can radiation produce mutations in the offspring of an exposed organism?

**A** It doubles the amount of DNA within egg or sperm cells.

**B** It changes recessive traits to dominant traits and vice versa.

**C** It allows non-DNA proteins to control the expression of various traits.

**D** It rearranges the genetic information in the DNA of an egg or sperm cell.

**8** John scraped his knee. Predict what could happen if he had fewer white blood cells than normal.

**A** His body could not get enough oxygen to damaged tissues.

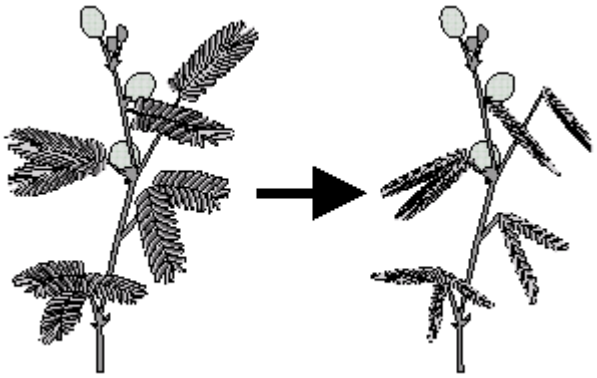
**B** His tissues could not take advantage of glucose to produce energy.

**C** His body could not manufacture proteins to mend damaged tissues.

**D** His tissues could not resist infection from bacteria entering the scrape.

**Use the following information to answer items 10 through 13.**

*Mimosa pudica* plant



The *Mimosa pudica* plant can fold and droop its small, divided leaves when stimulated by touch. At the base of each leaf stalk is a swollen region of motor tissue called a pulyinus. When the leaf is touched, potassium is pumped out of the cells in this region. This causes water to flow out of the cells, which in turn causes them to lose their rigidity. Scientists have also noticed the transmission of electrical impulses between the cells during this process. The leaves usually reopen within minutes. Some scientists suspect that this response serves to discourage grazing animals and flying insects from eating the plants.

**10** Which function of animal nerve cells is present in the *mimosa* plant?

**A** the ability to droop when stimulated

**B** the ability to regulate photosynthesis

**C** the ability to pump oxygen into blood

**D** the ability to transmit electrical impulses

**11** Which of the following represents an assumption made by biologists studying the mimosa plant?

**A** The swollen structure at the base of each leaf is called the pulyinus.

**B** When the leaf is touched, the leaves suddenly fold together and droop.

**C** The response discourages grazing animals and insects from eating the plants.

**D** There are electrical pulses passing between cells during the reaction process.

**12** Which of the following might explain why the drooping response of the mimosa plant might deter plant-eating insects?

**A** Insects would find it difficult to stay on the leaves.

**B** Insects find potassium extremely distasteful within plant matter.

**C** Insects would be shocked by the electric impulses in the plant's cells.

**D** Insects would be washed away by the sudden flow of water in the leaves.

**ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.**

**13** **Constructed-Response (3 points)**

A friend claims that although drooping might be a defense mechanism for the mimosa plant, prolonged drooping might decrease the amount of photosynthesis the plant cells can perform.

• Design a *three-step* procedure to test this claim.

**NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.**

## Item 13 Scoring Rubric

### Acceptable Responses

STEP 1

–Place both plants/groups in equal sunlight and provide the same soil, equal carbon dioxide and water.

OR

-Place both plants/groups under the same conditions

STEP 2

–Touch the experimental plant/group and do not touch or touch less the control plant/group, causing it to droop.

STEP 3 (Student must include **ONE** of the following points in his or her response.)

-Compare data between groups.
-Judge differences in color, health, or life spans between groups.
-Make observations.

### Scoring Guide

3 points = All three points are given correctly.
2 points = Two points are given correctly.
1 point = One point is given correctly.
0 points = Student fails to understand the task, or fails to provide a response.

3 points

**13** Design a *three-step* procedure to test this claim.

Step 1: Touch the plant to see if leaves fall off.
Step 2: See how long it takes for it to grow back.
Step 3: See if it takes longer for it to grow back a second time and see if it grows back to the same height if it does not then it is decreasing the amount of photosynthesis.

**Score Point: 0**

This response does not provide an adequate design.

3 points

**13** Design a *three-step* procedure to test this claim.

First step get a plant
2nd step put it out in the sun
3rd step write down what happens

**Score Point: 1**

This response correctly designs one-step of a three-step procedure: Step 3 (write down what happens).

3 points

**13** Design a *three-step* procedure to test this claim.

Procedure

1. Get a mimosa plants touch one, don't touch other
2. Collect data after about 8 days
3. decide whether this ✓ amount of protosynthesis the plant cell can perform.

**Score Point: 2**

This response correctly designs two-steps in a three-step procedure: Step 2 (touch one doesn't touch other); Step 3 (collect data).

3 points

**13** Design a *three-step* procedure to test this claim.

A three-step procedure to test whether prolonged drooping might decrease the amount of photosynthesis the plant cells can perform would be to: first take two plants and set them both in a sunny area and give them the same amount of water. The second step would be to make sure that something was always touching one of the plants. The third step would be to make observations.

**Score Point: 3**

This response correctly designs a three-step procedure: Step 1 (takes two plants...and give them the same amount of water); Step 2 (touching one of the plants); Step 3 (make observations).

**18** Vampire bats can detect heat from victims through their noses. What type of electromagnetic energy is detected by the bat's nose?

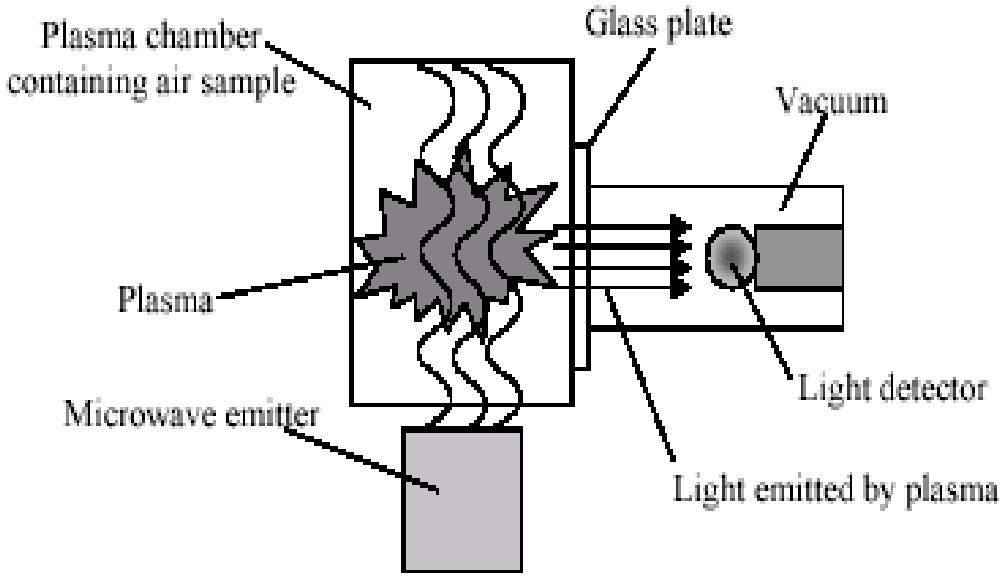
**A** gamma

**B** infrared

**C** ultraviolet

**D** microwave

**Use the following information to answer items 21 through 24.**




**Simplified diagram of an 'Electric Canary'**

An 'electric canary' is a device developed to detect pollutants in air. It uses microwaves to turn air samples into plasma. Plasma is a high temperature state of matter, hotter than the gaseous state, consisting of charged particles and electrons. This plasma emits light, and a vacuum-sealed light detector identifies the wavelengths of this light. Different pollutants in the air sample cause the plasma to emit different wavelengths of light, and are thereby detected.

**21** Which of the following properties of the glass plate is important for the detection of light by the light detector?

**A** It emits visible light.

**B** It reflects visible light.

**C** It absorbs visible light.

**D** It transmits visible light.

**22** The microwaves have longer wavelengths than those detected by the light detector. This means that microwaves, when compared to the waves detected by the detector, have which of the following?

**A** higher pitch

**B** higher energy

**C** lower velocity

**D** lower frequencies

**23** Which of the following best describes the situation when the air is first heated by the microwaves in the plasma chamber?

**A** The molecules become nearly motionless.

**B** The molecules form densely-packed crystal patterns.

**C** The molecules move rapidly and exert pressure on the chamber walls.

**D** The molecules form globular masses and lower the pressure of the chamber.

**ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.**

**24** **Constructed-Response (3 points)**

An investigator places different pollutants in air samples to test what pollutants can be detected by the electric canary.

- What would be the investigator's control group and experimental group?
- Explain why the investigation would need a control group.

**NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.**

**Item 24 Scoring Rubric**

**Acceptable Responses**

CONTROL GROUP
–The control group would be a sample without pollutants (or with known pollutants).
**Note:** Regular/normal air is not an acceptable response.

EXPERIMENTAL GROUP
–The experimental group would be all the samples that contain pollutants (or with unknown pollutants).

WHY (Student must include one of the following points in his or her response.)
–A control group would ensure that there is no other pollutant in the air.
–A control group would give a basis upon which to compare the results of the experimental group (either to themselves, or to the control group).
–A control group would make sure the electric canary is functioning properly.
–A control group would inform the investigator which wavelengths indicate no pollutant.

**Scoring Guide**

3 points = All three points are given correctly.
2 points = Two points are given correctly.
1 point = One point is given correctly.
0 points = Student fails to understand the task.

3 points

**24** What would be the investigator's control group and experimental group?

The air sample would be the control group & the electric canary would be the experimental group.

Explain why the investigation would need a control group.

The investigation would need a control group to help keep the experiment under control & determine how much exactly per how much of the control there is.

**Score Point: 0**

This response does not provide an adequate response.

3 points

**24** What would be the investigator's control group and experimental group?

The control group should be Oxygen, the experimental group should be Carbon Monoxide.

Explain why the investigation would need a control group. They need a control group to compare it with the experimental groups.

**Score Point: 1**

This response correctly explains why a control group is needed (to compare it).

3 points

**24** What would be the investigator's control group and experimental group?

The control group would be clean air.

Explain why the investigation would need a control group.

He would need clean air so he can make sure if the canary will detect anything or not.

**Score Point: 2**

This response correctly identifies a control group (clean air) and explains why (make sure if canary will detect anything or not).

3 points

**24** What would be the investigator's control group and experimental group?

The control would be a test of clean air and the experimental group would be the pollutants in the air.

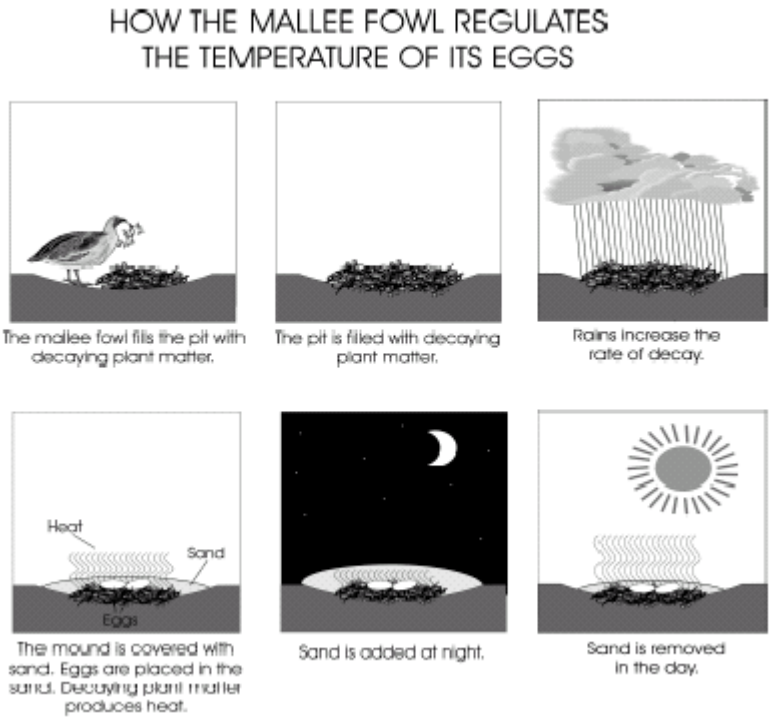
Explain why the investigation would need a control group.

It would need a control so you could know how it reacts when it detects pollution versus nothing.

**Score Point: 3**

This response correctly identifies a control group (clean air); an experimental group (pollutants in air) and explains why (reacts when it detects pollution versus nothing).

**Use the following information to answer items 36 through 39.**




In the desert, where the nights can often be very cold, birds must keep their eggs warm at night. Some desert birds, such as the mallee fowl of Australia, incubate their eggs in mounds of decaying plants. They dig a pit and fill it partially with bark and decaying plant matter. The mallee then waits for rain to speed up the decaying process. Shortly after, it fills the rest of the pit with sand and lays its eggs in the sand, which is heated by the decaying plant matter. The mallee removes sand to cool the eggs during the day.

**36** Mallee eggs are warmed at night by which of the following?

**A** nuclear changes

**B** ultraviolet waves

**C** chemical changes

**D** gravitational potential energy

**37** The mallee eggs are heated in the sand because heat moves in which of the following ways?

**A** from a cold region to a warm region by convection

**B** from a warm region to a cold region by convection

**C** from a warm region to a cold region by conduction

**D** from a cold region to a warm region by conduction

**38** Some scientists claim that the mallee fowl has evolved large feet in order to build these incubation mounds. What question, if answered "yes," would help you believe this claim?

**A** Do all birds in the desert lay eggs?

**B** Do the feet of mallee fowls grow as they construct these mounds?

**C** Do non-inheritable traits acquired by parents pass on to young mallee?

**D** Do genetically similar birds that do not build mounds have smaller feet?

**ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.**

**39** **Constructed-Response (3 points)**

- What role do bacteria play in this incubation process?
- Identify one of the nutrients bacteria release during this process.
- Why is this important for the ecosystem in which the mallee fowl lives?

**NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.**

**Item 39 Scoring Rubric**

**Acceptable Responses**

ROLE (Student must include one of the following points in his or her response.)
-Decomposes the plant matter.
–It is what makes the plant matter decay/rot.
–Any response which states that bacteria break down/decay plant/organic matter.

NUTRIENT (Student must include one of the following points in his or her response.)
Nitrogen (N)/sulfur (S)/phosphorous (P)/potassium (K)/magnesium (Mg)/calcium (Ca)/iron (Fe)/Chlorine (Cl)/manganese (Mn)/boron (B)/zinc (Zn)/copper (Cu)/molybdenum (Mo).

WHY
-This is important because they provide nitrogen/nutrients for plants/soil.
–They cycle important nutrients through the ecosystem.
–This is part of the nitrogen/phosphorous (or any other biogeochemical) cycle.
–Helps the plants grow.
OR
Deserts do not have nutrients in abundance.
OR
Affects the population of the birds.

**Scoring Guide**

3 points = Three points are given correctly.
2 points = Two points are given correctly.
1 point = One point is given correctly.
0 points = Student fails to understand the task.

3 points

**39** What role do bacteria play in this incubation process?

- Bacteria plays a huge role in it.

Identify one of the nutrients bacteria release during this process.

- It let's out energy

Why is this important for the ecosystem in which the mallee fowl lives?

- So they can survive there to live.

**Score Point: 0**

This response does not provide an adequate answer.

3 points

**39** What role do bacteria play in this incubation process?

Bacteria makes the plant matter decay. which makes the decay plant matter release heat.

Identify one of the nutrients bacteria release during this process.

The bacteria releases carbon.

Why is this important for the ecosystem in which the mallee fowl lives?

It makes the bacteria make plant decay and produce heat.

**Score Point: 1**

This response correctly explains the role of bacteria (makes plant matter decay).

3 points

**39** What role do bacteria play in this incubation process?

Bacteria helps break down the decaying plant matter.

Identify one of the nutrients bacteria release during this process.

Bacteria releases nitrogen during this process. It helps regulate the heat.

Why is this important for the ecosystem in which the mallee fowl lives?

**Score Point: 2**

This response correctly explains the role of bacteria (break down decaying plant) and identifies a nutrient (nitrogen).

3 points

**39** What role do bacteria play in this incubation process?

1. Bacteria produces heat as they break down matter

Identify one of the nutrients bacteria release during this process.

2. proteins and amino acids, as well as nitrogen

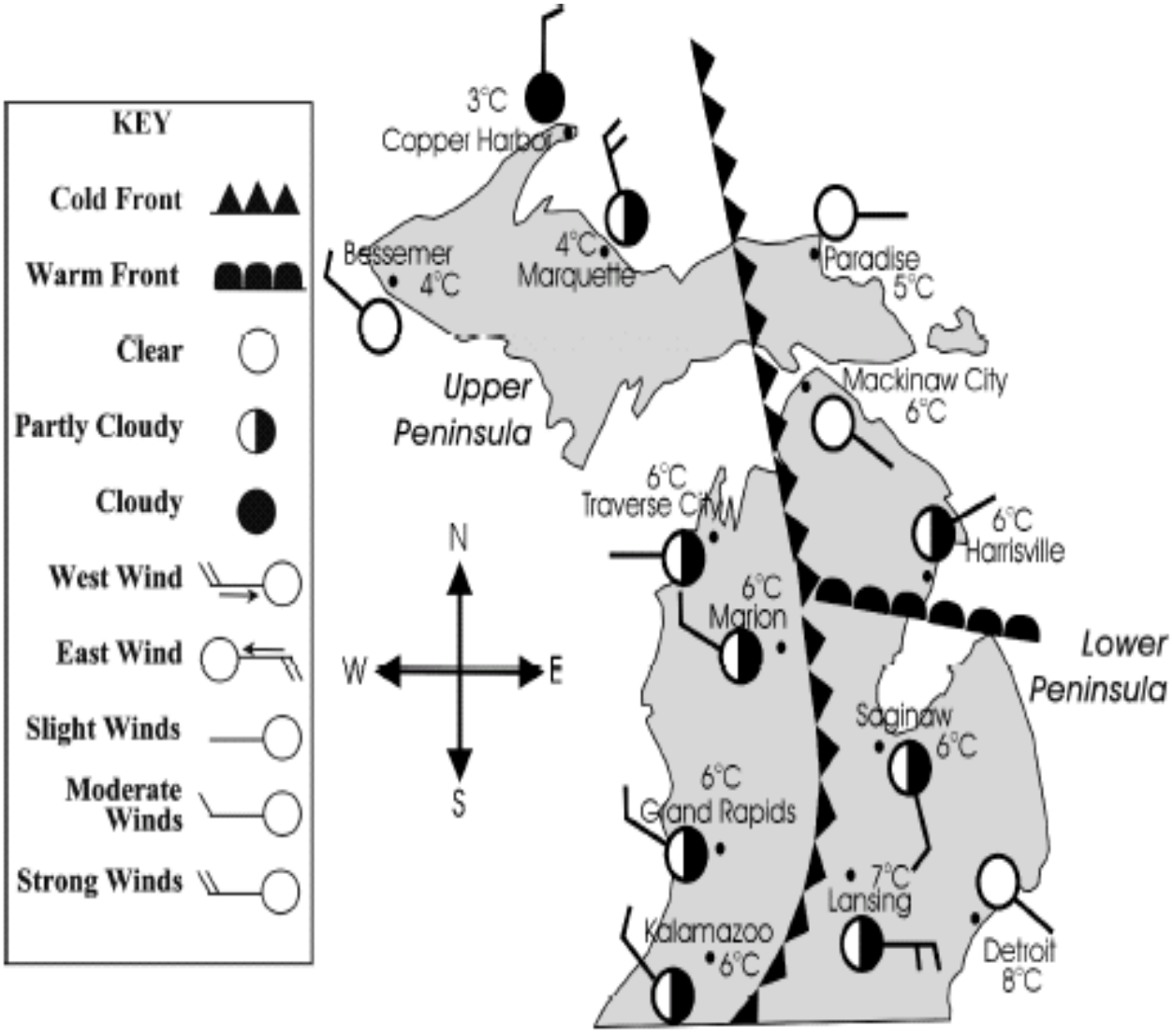
Why is this important for the ecosystem in which the mallee fowl lives?

3. This keeps the nest warm and ensures the survival of the next generation of offspring.

**Score Point: 3**

This response correctly explains the role of bacteria (break down matter) identifies a nutrient (nitrogen) and explains why (ensures the survival of the next generation of offspring).

**Use the following information to answer items 40 through 43.**




**40** According to the weather map, in which location would a rain gauge most likely have the highest measurements?

**A** Marion

**B** Marquette

**C** Copper Harbor

**D** Mackinaw City

**41** Which of the following would you most likely find just south of Harrisville?

**A** a cold air mass absorbing a warm air mass

**B** a warm air mass trapped by a cold air mass

**C** a cold air mass rising over a warm air mass

**D** a warm air mass rising over a cold air mass

**42** How are the winds shown in this map different from winds caused directly by Earth's rotation (called global winds)?

**A** The winds on the map depend on convection; global winds do not.

**B** Warm air rises in the winds on the map, but sinks in global winds.

**C** The winds on the map do not move in regular motions like global winds.

**D** The winds on the map move in a more circular direction than global winds.

**ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.**

**43** **Constructed-Response (3 points)** Provide three predictions of how the weather in Lansing will change after the cold front passes.

**NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.**

**Item 43 Scoring Rubric**

**Acceptable Responses**

- PREDICTIONS
  - –Clearing skies.
  - –Lower temperatures.
  - –Wind direction will be westerly or northerly. *****
  - –Decrease in wind speed.
  - –Drop in humidity
  - –Increase in pressure.
  - -Probability for rain is low

- Winds are named for which direction they are originating (i.e. "westerly winds" are blowing eastward from the west), thus it is not correct to say, "they are blowing west, westerly or westward".

**Note:** Very cold or clear are too extreme to be acceptable responses.

**Scoring Guide**

3 points = All three points are given correctly.
2 points = Two points are given correctly.
1 point = One point is given correctly.
0 points = Student fails to understand the task, or fails to provide a response.

3 points

43 Provide three predictions of how the weather in Lansing will change *after* the cold front passes.

Three ways the weather changes in Lansing. Lansing whether changes alot. It might get hot, it might get wildy and it might rain you never know in Michigan it might even snow.

**Score Point: 0**

This response does not provide an adequate answer.

3 points

43 Provide three predictions of how the weather in Lansing will change *after* the cold front passes.

Three predictions of how the weather will change in lansing after the cold front passes are a warmer temperature slight winds and a clear day.

**Score Point: 1**

This response provides one correct prediction of how weather will change (slight winds).

3 points

43 Provide three predictions of how the weather in Lansing will change *after* the cold front passes.

After the cold front passes over lansing the weather changes by:

1) colder
2) west wind
3) clear

**Score Point: 2**

This response provides two correct predictions of how weather will change (colder/ westward).

3 points

43 Provide three predictions of how the weather in Lansing will change *after* the cold front passes.

The weathe in Lansing will change after the front passes throughe. The wind will change to a west wind. The wind will only be a moderate winde. The temperature will also drop.

**Score Point: 3**

This response provides three correct predictions of how weather will change (wind will change to west wind/moderate wind/temperature will drop).

**45** Pure iron is a valuable element. In natural deposits, iron is often found bonded with other elements as iron ore. Therefore, which of the following is true?

**A** Iron ore is a renewable resource, but pure iron is non-renewable.

**B** It is impossible to obtain pure iron from natural iron deposits.

**C** It is possible to obtain more iron per gram of ore than from a gram of pure iron.

**D** It is more reasonable to recycle used iron rather than to rely on new deposits of iron ore.

# High School Key

| Item # | Key |
|---|---|
| 4 | D |
| 8 | D |
| 10 | D |
| 11 | C |
| 12 | A |
| 18 | B |
| 21 | D |
| 22 | D |
| 23 | C |
| 36 | C |
| 37 | C |
| 38 | D |
| 40 | C |
| 41 | D |
| 42 | C |
| 45 | D |